



## D1 line User manual

ASCON spa  
ISO 9001  
certified

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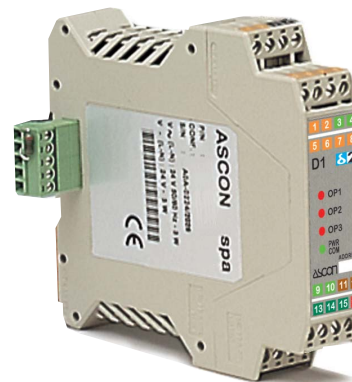
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## DIN-rail mounting temperature controller with current transformer input

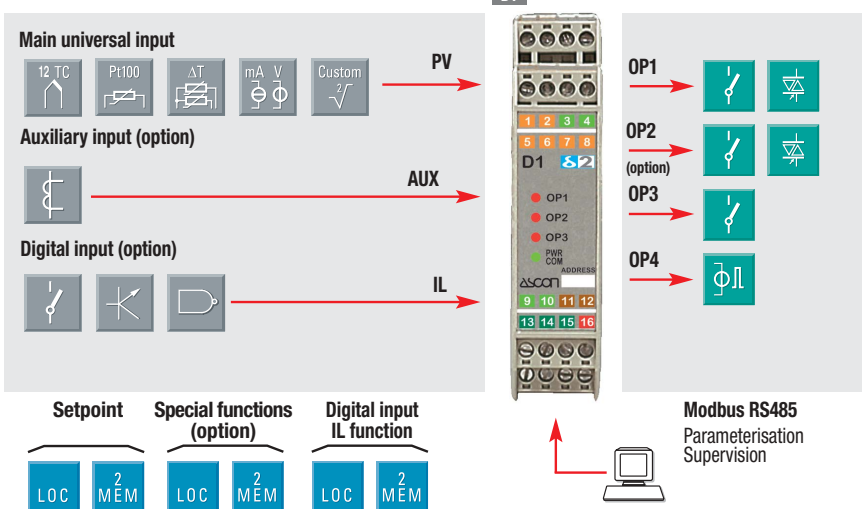
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S E R I E S

### D1 line

User Manual • M.I.U. D1-4/08.09 • Cod. J30-478-1AD1 IE



### Resources



### Operating mode

| Control |                        | Alarms |     |     |
|---------|------------------------|--------|-----|-----|
|         |                        |        |     |     |
| 1       | Single action          | OP1    | OP2 | OP3 |
| 2       |                        | OP4    | OP1 | OP2 |
| 4       | Double action          | OP1    | OP2 | OP3 |
| 5       |                        | OP1    | OP4 | OP2 |
| 6       | Double action (option) | OP4    | OP2 | OP1 |

Fuzzy tuning with automatic selection

|  |                         |  |                               |
|--|-------------------------|--|-------------------------------|
|  | One shot<br>Auto tuning |  | One shot<br>Natural frequency |
|--|-------------------------|--|-------------------------------|

### Model code

| Model |      |         | Configuration |          | The product code indicates the specific hardware configuration of the instrument, that can be modified by specialized engineers only |
|-------|------|---------|---------------|----------|--|
| Mod.  | Line | Basic   | Accessories   | 1st part | 2nd part   |
|       | D 1  | 5 B 5 D | E F 0 0       | I L M N  | O P Q R  |

#### Line D 1

| Output OP1-OP2     | B |
|--------------------|---|
| Relay - Not fitted | 0 |
| Relay - Relay      | 1 |
| SSR - Not fitted   | 3 |
| SSR - SSR          | 5 |

| Options                  | D |
|--------------------------|---|
| None                     | 0 |
| Current transformer (CT) | 3 |

| Special functions | E |
|-------------------|---|
| None              | 0 |
| Start up + Timer  | 2 |

| User manual                | F |
|----------------------------|---|
| Italian/English (standard) | 0 |
| French/English             | 1 |
| German/English             | 2 |
| Spanish/English            | 3 |

| Input type and range        |                   | I                | L   |
|-----------------------------|-------------------|------------------|-----|
| TR Pt100 IEC751             | -99.9...300.0 °C  | -99.9...572.0 °F | 0 0 |
| TR Pt100 IEC751             | -200...600 °C     | -328...1112 °F   | 0 1 |
| TC L Fe-Const DIN43710      | 0...600 °C        | 32...1112 °F     | 0 2 |
| TCJ Fe-Cu45% Ni IEC584      | 0...600 °C        | 32...1112 °F     | 0 3 |
| TC T Cu-CuNi                | -200...400 °C     | -328...752 °F    | 0 4 |
| TC K Chromel-Alumel IEC584  | 0...1200 °C       | 32...2192 °F     | 0 5 |
| TC S Pt10%Rh-Pt IEC584      | 0...1600 °C       | 32...2912 °F     | 0 6 |
| TC R Pt13%Rh-Pt IEC584      | 0...1600 °C       | 32...2912 °F     | 0 7 |
| TC B Pt30%Rh Pt6%Rh IEC584  | 0...1800 °C       | 32...3272 °F     | 0 8 |
| TC N Nichrosil-Nisil IEC584 | 0...1200 °C       | 32...2192 °F     | 0 9 |
| TC E Ni10%Cr-CuNi IEC584    | 0...600 °C        | 32...1112 °F     | 1 0 |
| TC Ni-NiMo18%               | 0...1100 °C       | 32...2012 °F     | 1 1 |
| TC W3%Re-W25%Re             | 0...2000 °C       | 32...3632 °F     | 1 2 |
| TC W5%Re-W26%Re             | 0...2000 °C       | 32...3632 °F     | 1 3 |
| Dc input 0...50mV           | Engineering units |                  | 1 4 |
| Dc input 10...50mV          | Engineering units |                  | 1 5 |
| Custom input range          |                   |                  | 1 6 |

| Control mode                 |                    | M |
|------------------------------|--------------------|---|
| ON-OFF reverse action        |                    | 0 |
| ON-OFF direct action         |                    | 1 |
| P.I.D. single reverse action |                    | 2 |
| P.I.D. single direct action  |                    | 3 |
| double action                | Linear cool output | 4 |
|                              | ON-OFF cool output | 5 |
|                              | Water cool output  | 6 |
|                              | Oil cool output    | 7 |

| Output configuration |                            | N |
|----------------------|----------------------------|---|
| Single action        | Double action              |   |
| Relay                | Heat Relay, Cool Relay     | 0 |
| SSR drive            | Heat Relay, Cool SSR Drive | 1 |
|                      | Heat SSR Drive, Cool Relay | 2 |

| Alarm type and function              |                                | O | P | Q |
|--------------------------------------|--------------------------------|---|---|---|
| AL1, AL2 and AL3                     | AL...                          | 1 | 2 | 3 |
| Disabled or used by Timer (AL3 only) |                                | 0 | 0 | 0 |
| Sensor break/LBA                     |                                | 1 | 1 | 1 |
| Absolute                             | active high                    | 2 | 2 | 2 |
|                                      | attivo basso                   | 3 | 3 | 3 |
| Deviation                            | active high                    | 4 | 4 | 4 |
|                                      | attivo basso                   | 5 | 5 | 5 |
| Banda                                | active out                     | 6 | 6 | 6 |
|                                      | active in                      | 7 | 7 | 7 |
| Heater Break                         | active during ON output state  | 8 | 8 | 8 |
| from CT                              | active during OFF output state | 9 | 9 | 9 |

| Setpoint type                        |  | R |
|--------------------------------------|--|---|
| Local only                           |  | 0 |
| Local and 2 tracking stored Setpoint |  | 1 |
| Local and 2Stand-by stored Setpoint  |  | 2 |

## Standard parameters description

Configuration parameters, shown in the parameters table, have been divided into groups with homogeneous functionalities. The parameters described hereafter are in the same order as they are listed in the parameters table.

### Configuration

#### IL Digital input function

Table 1

|                     |
|---------------------|
| Not used            |
| PV measure hold     |
| Auto/Man            |
| 1st stored Setpoint |
| 2nd stored Setpoint |
| Run Timer           |

#### unit Engineering units

Table 2

|                        |            |
|------------------------|------------|
| C (degree Centigrade)  | A (Ampere) |
| °F (degree Fahrenheit) | bar        |
| - None                 | psi        |
| mV (millivolt)         | Rh         |
| V (Volt)               | pH         |
| mA (milliampere)       |            |

### Setpoint (SP)

#### A1S.P AL1 threshold

#### A2S.P AL2 threshold

#### A3S.P AL3 threshold

Alarm occurrences of OP1, OP2 and OP3 outputs, respectively linked to AL1, AL2 and AL3.

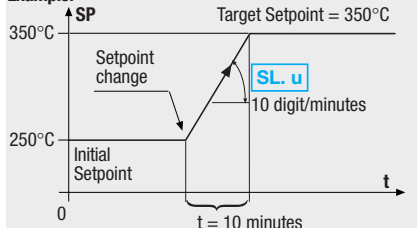
The range of the alarm threshold correspond to the whole span and it is not limited by the SP Setpoint span.

#### SL.u Setpoint ramp up

#### SL.d Setpoint ramp down

This parameter specifies the maximum rate of change of the SP in digit/min. The SP value is reached according to the configured rate of change. The new SP value is called "Target SP" (available via serial communications).

Example:

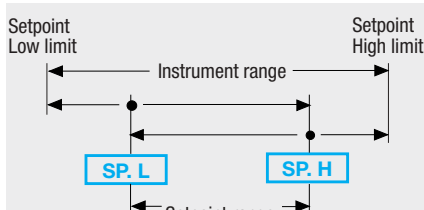


When the parameter is OFF, this function is disabled and the new Setpoint is reached immediately after being entered.

#### SL.u Setpoint low limit

#### SL.d Setpoint high limit

Low / high limit of the Setpoint value.



#### SP.1 1st stored SP

#### SP.2 2nd stored SP

Values of the two Setpoints, that are activated by mean of digital input or communications parameters. If configured with "Tracking", the previous Local Setpoint value will be lost, when the stored Setpoint is selected.

If configured with "Stand-by" the Local Setpoint value will not be lost, when the Stand-by Setpoint is selected. It will operate again when back to Local.

## Table of standard parameters

| Configuration |                               |                                    |                 |                 |                         |
|---------------|-------------------------------|------------------------------------|-----------------|-----------------|-------------------------|
| Mnemonic code | Parameter description         | Range                              | Units           | Factory setting | Notes                   |
| IL            | Digital input function IL     | see table 1                        |                 | not used        |                         |
| PS.tr         | Instrument position           | Alone/left side/central/right side |                 | Alone           |                         |
| Unit          | Engineering unit              | see table 2                        |                 | none            |                         |
| Sc.dd         | No. of decimals               | 0...3                              |                 | 0               | Linear scales only      |
| SC.Lo         | Low range                     | -999...9999                        | engineer. units | Low range       | Minimum range 100 digit |
| SC.Hi         | High range                    | -999...9999                        | engineer. units | High range      |                         |
| Prot          | Communications protocol       | Modbus/Jbus                        |                 | Modbus          |                         |
| baud          | Baud rate                     | 1200, 2400, 4800, 9600 baud        |                 | 9600            |                         |
| O.C.rb        | Enhanced Overshoot management | 0.2...5.0                          |                 | 0.5             | P.I.D. only             |

| Setpoint      |                       |                    |                 |                 |  |
|---------------|-----------------------|--------------------|-----------------|-----------------|--|
| Mnemonic code | Parameter description | Range              | Units           | Factory setting | Notes  |
| A1S.P         | AL1 alarm threshold   | PV range           | engineer. units | 0               | not enabled if the controller has been configured with alarm not active or with sensor break alarm |
| A2S.P         | AL2 alarm threshold   | PV range           | engineer. units | 0               |  |
| A3S.P         | AL3 alarm threshold   | PV range           | engineer. units | 0               |  |
| SL.u          | Setpoint ramp up      | OFF/0.1...999.9    | digit/min       | inhibited       | With OFF the new Setpoint is reached immediately after being entered.                              |
| SL.d          | Setpoint ramp down    | OFF/0.1...999.9    | digit/min       | inhibited       |  |
| SP.L          | Setpoint low range    | low range...SP.H   | engineer. units | low range       |  |
| SP.H          | Setpoint high range   | S.P.L...high range | engineer. units | high range      |  |
| SP.1          | 1st stored Setpoint   | PV range           | engineer. units | ----            |  |
| SP.2          | 2nd stored Setpoint   | PV range           | engineer. units | ----            |  |
| SP            | Setpoint              | PV range           | engineer. units | ----            |  |

| Control mode  |                                |                  |            |                 |                           |
|---------------|--------------------------------|------------------|------------|-----------------|---------------------------|
| Mnemonic code | Parameter description          | Range            | Units      | Factory setting | Notes                     |
| hy            | Control output hysteresis      | 0.1...10.00      | % PV range | 0.5             |                           |
| tune          | Tune run/stop                  | Start/stop       |            |                 |                           |
| P.b.          | Proportional band              | 0.5...999.9      | % PV range | 5.0             |                           |
| t.i.          | Integral time                  | OFF/0.1...100.0  | min        | 5.0             |                           |
| t.d.          | Derivative time                | OFF/0.01...10.00 | min        | 1.00            |                           |
| O.C.          | Overshoot control              | 0.01...1.00      |            | 1.00            | Setting 1 is disabled     |
| M.res         | Manual reset                   | 0.0...100.0      | % ouput    | 50.0            | Without integral time     |
| d.err         | Error dead band                | OFF/0.01...10.0  | digit      | inhibited       |                           |
| t.c.          | Cycle time                     | 1...200          | s          | 20              | Time proportional only    |
| OP.H          | Control output high limit      | 10.0...100.0     | % ouput    | 100.0           |                           |
| S.Out         | Control output safety value    | 0.0...100.0      | % ouput    | 0               | -100.0...+100.0 Heat/Cool |
| dbnd          | Dead band                      | -10.0...10.0     | % ouput    | 0.5             |                           |
| r.C.G.a       | Cool relative gain             | 0.1...10.0       |            | 1               |                           |
| hy.C          | Cool output hysteresis         | 0.1...10.0       | % PV range | 0.5             | ON/OFF only               |
| t.c.C         | Cool cycle time                | 1...200          | s          | 20              | Time proportional only    |
| OP.HC         | Cool control output high limit | 10.0...100.0     | % ouput    | 100.0           | P.I.D. only               |
| A.Man         | Auto/man selection             | Auto/Man         |            | Auto            |                           |

| Alarm and Auxiliary |                             |                     |         |                 |  |
|---------------------|-----------------------------|---------------------|---------|-----------------|--|
| Mnemonic code       | Parameter description       | Range               | Units   | Factory setting | Notes  |
| A1hy                | AL1 hysteresis              | 0.1...10.0          | % range | 0.5             | The same parameters are available for AL2 and AL3 alarms |
| A1LB                | Alarm Latching and Blocking | none/Ltch/Bloc/LtBL |         | none            |  |
| t.Lba               | LBA delay                   | OFF / 1...9999      | s       | inhibited       | OFF = sensor break                                       |
| St.OP               | Soft-start output value     | OFF/0.1...100.0     | % ouput | 0.5             | t.mod = OFF only   |
| St.tn               | Soft-start activation time  | 1...9999            | s       | 1               | ONly if St.OP different than OFF                         |
| t.Fil               | Filter time costant         | OFF/1...30          | s       | inhibited       |  |
| in.Sh               | Input shift                 | OFF/-60...+60       | digit   | inhibited       |  |
| Addr                | Communications address      | 1...247             |         | 247             |  |
| Ht.FS.              | CT primary high range       | OFF/1...200         | A       | 100             |  |

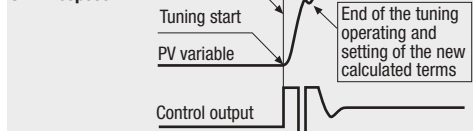
### Control mode

#### tune Automatic tune

The Fuzzy Tuning determines automatically the best method to use to calculate the P.I.D. term, according the process conditions.

Method 1:

STEP respore

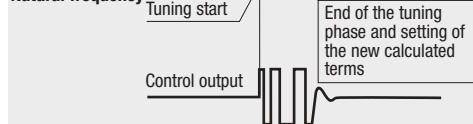


This type is selected when, at the start of the autotune operation, the PV is far from the Setpoint of more than 5% of the span.

This method has the big advantage of fast calculation, with a reasonable accuracy in the term calculation.

Method 2:

Natural frequency



This type is selected when the PV is close to the SP Setpoint.

This method has the advantage of a better accuracy in the term calculation with a reasonable speed calculation.

#### p.B. Proportional band

This parameter specifies the proportional band coefficient that multiplies the error (SP - PV)

#### t.i. Integral time

It's the integral time value, that specifies the time required by the integral term to generate an output equivalent to the proportional term. When OFF the integral term is not included in the control algorithm.

#### t.d. Derivative time

It is the time required by the proportional term P to repeat the output provided by the derivative term D. When OFF the derivative term is not included in the control algorithm.

#### O.C. Overshoot control

This parameter specifies the span of action of the overshoot control. Setting lower values (1.00 → 0.01) the overshoot generated by a Setpoint change is reduced. The overshoot control doesn't affect the effectiveness of the P.I.D. algorithm. Setting 1, the overshoot control is disabled.

#### OC.rb Enhanced overshoot management

Configuration parameter. Defines a zone across the Setpoint where the P.I.D. algorithm is not affected by overshoot control. Setting range 0.2... 5.0.

Default value 0.5.

If OC.rb < 1 the non influenced zone is inside the proportional band, if OC.rb > 1 the non influenced zone is outside the proportional band

Reducing the OC.rb value causes higher overshooting effect and longer times in reaching the Setpoint.

**OC.rb** (continue)

Increasing the OC.rb value increases the zone, near the Setpoint, in which the P.I.D. functions with its natural dynamic mode, this reduces the time in reaching the Setpoint.

**Setting procedure for OC and OC.rb parameters**

- 1 Set O.C. = 1 and OC.rb = 0.5 and observe the process behaviour.
- 2 If overshoot or undershoot is not acceptable, set O.C. = 0.5.
- 3 If overshoot or undershoot is still not acceptable, reduce the O.C. value.
- 4 If there is no overshoot or undershoot, record the time required by the PV to reach the Setpoint.
- 5 If the time required by the process variable to reach the Setpoint value is too long, gradually increase the value of "OC.rb" (suggested steps = 0.5).
- 6 If an acceptable time to reach the Setpoint cannot be obtained with "OC.rb" values up to 2, increase the O.C. value and repeat the procedure re-starting from item 3.

**M.res** Manual reset

This specifies the control output value when PV = SP, in a PD only algorithm (lack of the integral term).

**d.err** Error Dead Band

Inside this band for (PV - SP), the control output does not change to protect the actuator (output Stand-by)

**t.c.** Control output cycle time**t.c.C** Cool output cycle time

It's the cycle time of the time proportioning control output. The P.I.D. control output is provided by the pulse width modulation of the waveform.

**OP.H** Control output high limit**OP.HC** Cool output high limit

It specifies the maximum value the control output can be set. Separate parameters for both heat and cool outputs limitation are available.

**S.Out** Output safety value

Output Value in case of input anomaly.

**d.bnd** Dead band

It is the zone where it is possible to separate or overlap the heat and cool actions.

**r.Cga** Relative cool gain

It permits to adjust the proportional cool action.

**Auxiliary parameters****In.Sh** Input shift

This value is added to the measured PV input value. Its effect is to shift the whole PV scale of up to  $\pm 60$  digits.

**Addr** Controller address

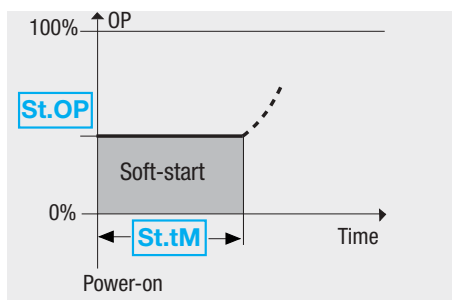
The address range is 1... 247 and must be unique for each controller on the communications bus to the supervisor.

**Soft-start control output function****St.OP** Soft-Start value

Value of the control output during the Soft-start activation time.

**St.TM** Soft-Start activation time

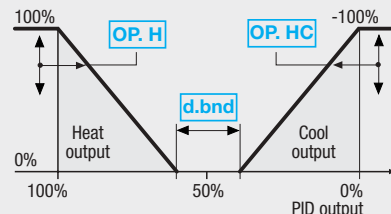
Time duration (starting from the power on) of the Soft-start function.

**Heat/Cool control**

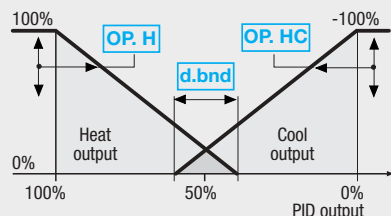
By a sole P.I.D. control algorithm, the controller handles two different outputs, one of these performs the Heat action, the other one the Cool action. **It is possible to overlap the outputs.**

**A - Heat/Cool actions separated**

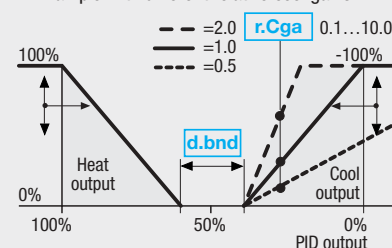
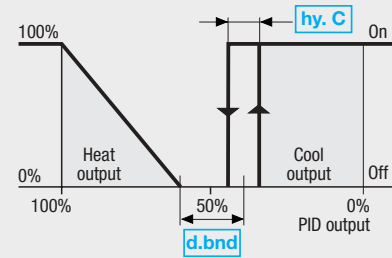
**d.bnd** positive 0...10.0%

**B - Heat/Cool actions overlapped**

**d.bnd** negative -10.0...0%

**C - Cool action adjusting**

Example with different relative cool gains

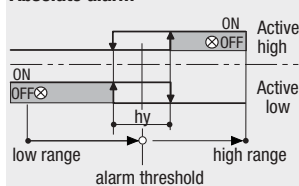
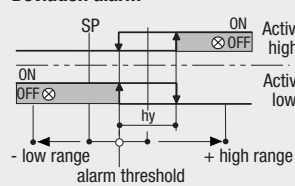
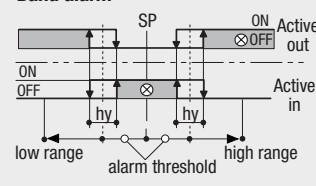
**D - ON-OFF Cool action**

Alarm occurrences of OP1 - OP2 - OP3 outputs, respectively linked to AL1 - AL2 - AL3

The relay/SSR output OP1, OP2 and OP3, can be used as alarm outputs only if they are not used as control outputs.

For each alarm is possible to configure:

- A** - The type and the operating condition of the alarm
- B** - The functionality of the alarm acknowledgement
- C** - The blocking function on start-up
- D** - Loop break or sensor break

**A - Alarm type and function****Absolute alarm****Deviation alarm****Band alarm****B/C - Latching and blocking enable****A1L.b** AL1, AL2, AL3**A2L.b** latching and**A3L.b** blocking

For each alarm it is possible to select the following functions:

- none
- latching
- blocking
- both latching and blocking

**Alarm acknowledge function**

The alarm, once occurred, is maintained until the time of acknowledgement. The acknowledgement operation is performed by serial communications.

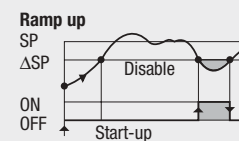
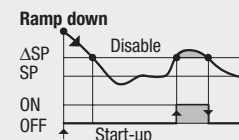
**After this operation, the alarm leaves the alarm state only when the alarm condition is no longer present.**

**D - "Loop Break Alarm" LBA or sensor break****t.Lba** LBA delay

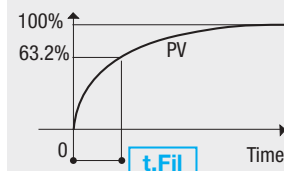
**Setting "none":** the alarm works as Sensor break with immediate action.

**Setting a value between 1 and 9999 s:** the alarm intervention is delayed; if the alarm is caused by a sensor break, the intervention is immediate.

**When the cause of the alarm disappears, the alarm status stops.**

**Start-up disabling**

$\Delta SP$  Threshold =  $SP \pm range$

**Input digital filter**

Time constant, in s, of the RC input filter applied to the PV input. **When this parameter is set to "inhibited" the filter is bypassed.**

## Special parameters description

- Start-up
- Timer

In order to have the above functions the product code digit **E** must be **2**

For example: mod. D1 3100-2000

⚠ These functions are not available when the instrument is configured for Heat/Cool control.

- 1 To select these two functions to use set the parameter as in table 3:

### t.Mod Timer/Start-Up operating mode

This parameter defines (see table 3):

- When the count starts.
- The state of the control output at the end of the count

- 2 To select the Start-up function select the code **1**

- 3 To select the Timer function select the value between **2...6** and use alarm AL3 (output OP3) configured with configuration code **Q = 0**.

Example: conf. **I L M N - O P 0 R**

Table 3

| Timer/Start-up counting mode            | Value                 |
|---|-----------------------|
| Disabled                                | <b>0</b>              |
| Start-up function                       | <b>1</b>              |
| Conting start time                      | End mode              |
| When inside the band                    | Control mode <b>2</b> |
|   | Output to 0 <b>3</b>  |
| When launched                           | Control mode <b>4</b> |
|   | Output to 0 <b>5</b>  |
| When launched with start-up and control | Control mode <b>6</b> |
| When launched with stand-by Setpoint    | Control mode <b>7</b> |

- 4 If Timer function is selected it will show the parameter above:

### t.Act Timer action

By this parameter can be defined:(see table 4)

- the time units
- the starting mode
- the OP3 status when the timer is running.

When the timer is not running, the OP3 takes the opposite status

### time Timer setting

Timer (1...9999 s/min.)

### S.P.SB Stand-by Setpoint

(only for **t.Mod** = 7)(SP L...SP H)

Table 4

| Time units | Strating mode                        | AL3 status [1] | Value    |
|------------|--------------------------------------|----------------|----------|
| Seconds    | Manual through serial communications | OFF            | <b>0</b> |
|            |                                      | ON             | <b>1</b> |
|            | Automatic at power ON [2]            | OFF            | <b>2</b> |
|            |                                      | ON             | <b>3</b> |
| Minutes    | Manual through serial communications | OFF            | <b>4</b> |
|            |                                      | ON             | <b>5</b> |
|            | Automatic at power ON [2]            | OFF            | <b>6</b> |
|            |                                      | ON             | <b>7</b> |

[1] If used by Timer

- 2 Using this selection, manual starting mode is possible too (through the serial communications port)

## Table of special function parameters - (if option installed)

| Timer and Start-Up |   |             |          |                 |                                    |
|--------------------|---|-------------|----------|-----------------|------------------------------------|
| Mnemonic code      | Parameter description                               | Range       | Units    | Factory setting | Notes                              |
| <b>t.Mod</b>       | Timer/Start-up operation mode                       | see table 3 |          | <b>0</b>        |                                    |
| <b>t.Act</b>       | Timer action  | see table 4 |          | <b>0</b>        | Only for t.Mod ≠ to OFF and 1 ≠ to |
| <b>time</b>        | Timer setting                                       | 1...9999    | s/min    | <b>0.5</b>      |                                    |
| <b>S.P.Sb</b>      | Stand-by Setpoint                                   | SP L...SP H |          | <b>0</b>        | For t.Mod = 7                      |
| <b>t.h.SU</b>      | Start-Up hold time                                  | 0...500     | min      | <b>1</b>        |                                    |
| <b>S.P.SU</b>      | Setpoint di Start-Up                                | SP L...SP H |          | <b>0</b>        |                                    |
| <b>OP.HS</b>       | Control output high limit during the Start-Up phase | 5.0...100.0 | % output | <b>100.0</b>    |                                    |

## Start-Up functions

Setting **t.Mod** to **1**

Three parameters are associated to the Start-up function:

### t.h.SU Start-Up hold time

### S.P.S.U Start-Up Setpoint

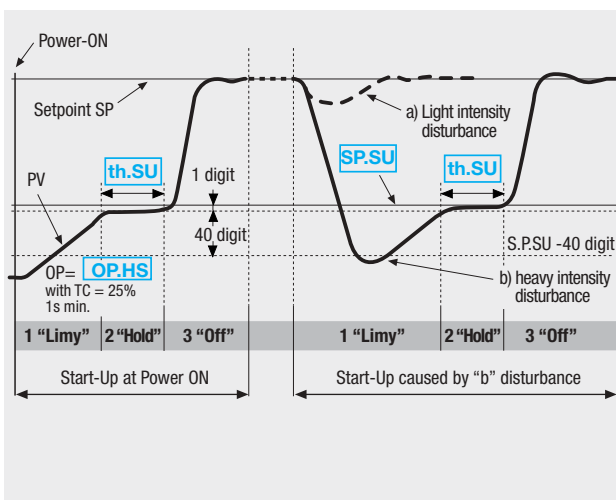
### OP.HS Control output high limit

The Start-up function includes three phases:

1<sup>a</sup> "Limy" - The control output is limited to the **OP.HS**

2<sup>a</sup> "Hold" - The process variable is maintained to the Start-up Setpoint **S.P.S.U** for the time fixed by the parameter **t.h.SU**

3<sup>rd</sup> "OFF" - When the **t.h.SU** time is elapsed the process variable is maintained to the working Setpoint.



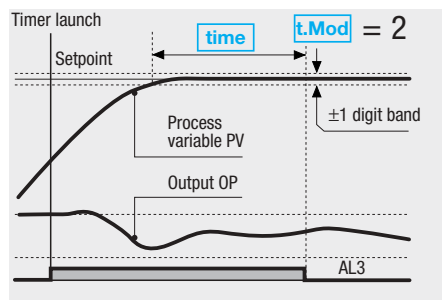
Notes:

- 1 - The "Hold" phase starts when the process variable PV achieves the **S.P.S.U** (with a tolerance of 1 digit).
- 2 - Whether the process variable, for any reason (e.g. load change), decreases at a value lower than (**OP.HS** - 40 digits), the Start-up function starts again from the "Limy" phase.
- 3 - When the Start-up is in Hold phase, if the local Setpoint becomes lower than the Start-up Setpoint **S.P.S.U** or if the operating mode changes to manual, the Start-up function passes to the "OFF" phase.

## Timer counting modes

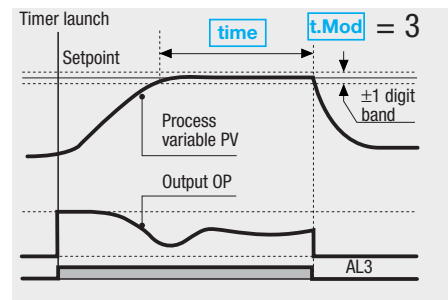
### A - Counting start time inside the band, end in control mode

The time counting starts only when the error is inside a  $\pm 1$  digit band. The control action is not affected by the Timer function.



### B - Counting start time inside the band, end with control output forced to zero

The time counting starts only when the error is inside a  $\pm 1$  digit band. At the end, the control output is forced to zero [1].



- 1 When the Timer is not running the OP control output is forced to zero, also before the Timer launch.

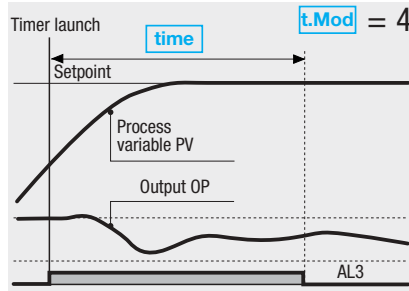


## Special function parameters description

### Timer function mode

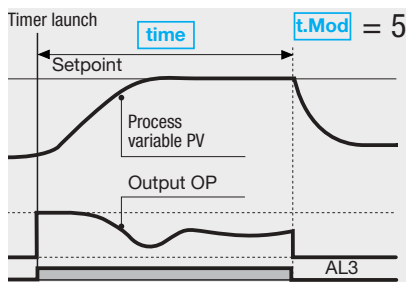
#### C - Counting start time = timer launch time, end in control mode.

The time counting starts when the timer is launched. The control action is not affected by the Timer function.



#### D - Counting start time = timer launch time, end with control output forced to zero.

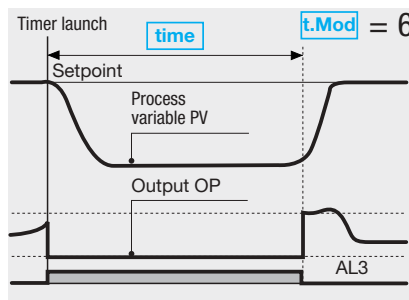
The time counting starts when the timer is launched. At the end, the control output is forced to zero. [1]



[1] When the Timer is not running the control output is forced to zero, also before the Timer launch.

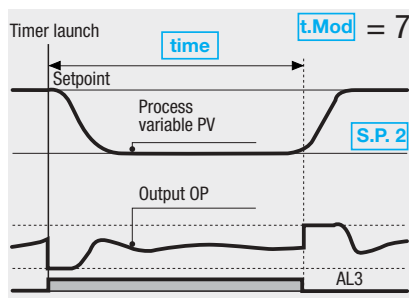
#### E - No control action during the counting time.

The time counting starts when the timer is launched and the control output is forced to zero. At the end, the control action starts.



#### F - Control action with stand-by Setpoint during the counting time

The time counting starts when the timer is launched and the control action use the Stand-by Setpoint. At the end, the control action use the working Setpoint.



## Technical specifications

| Features<br>(at 25°C env. temp.) | Description   |  |
|----------------------------------|---|--|
| Total configurability            | By means of the configuration tools is possible to choose:  |  |
|                                  | - the type of input<br>- the type of control input<br>- the type of output  | - the type and functionality of the alarms<br>- the type of Setpoint<br>- control parameter values   |
| PV Input                         | Common characteristics  | A/D converter with resolution of 50,000 points; update measurement time: 0.2 s; sampling time: 0.5 s; input bias: - 60...+ 60 digit; input filter: 1...30 s. OFF = 0 |
|                                  | Accuracy  | 0.25% ± 1 digit (for T/C and Pt100)<br>0.1% ± 1 digit (for mA and mV)  |
|                                  | Resistance thermometer (for ΔT: R1+R2 must be <320Ω)  | Pt100Ω à 0°C (IEC 751)<br>°C/°F selectable   |
|                                  | Thermocouple  | L, J, T, K, S, R, B, N, E, W3, W5 (IEC 584)<br>°C/°F selectable  |
|                                  | DC input current  | 0...20mA, 4...20mA with external shunt 2.5Ω<br>Rj > 10MΩ   |
|                                  | DC input voltage  | 10...50mV, 0...50mV<br>Rj > 10MΩ   |
| Auxiliary input                  | CT current transformer  | 50 or 100mA input hardware selection   |
| Digital input                    | The closure of the external contact produces any of the following actions: Auto/Man mode change, Stored Setpoints activation, measure hold. Timer activation (if options installed) |  |
| Mode of operation                | 1 single or double action P.I.D. loop or ON/OFF with 1, 2 or 3 alarms   |  |
| Control mode                     | Algorithm   | P.I.D. with overshoot control or ON-OFF<br>P.I.D. with valve drive algorithm, for controlling motorised positioners  |
|                                  | Proportional band (P)   | 0.5...999.9%   |
|                                  | Integral time (I)   | 0.1...100.0 min  |
|                                  | Derivative time (D)   | 0.01...10.00 min   |
|                                  | Error dead band   | 0.1...10.0 digit   |
|                                  | Overshoot control   | 0.01...1.00  |
|                                  | Manual reset  | 0.0...100.0%   |
|                                  | Cycle time (time proportional only)   | 1...200 s  |
|                                  | Control output high limit   | 10.0...100.0%  |
|                                  | Soft start output value   | 0.1...100.0%   |
|                                  | Output safety value   | 0.0...100.0% (-100.0...100.0% for Heat/Cool)   |
|                                  | Control output hysteresis   | 0.1...10.0%  |
|                                  | Dead band   | -10.0...10.0%  |
|                                  | Relative cool gain  | 0.1...10.0   |
| Control mode                     | Cycle time (time proportional only)   | 1...200 s  |
|                                  | Cool output high limit  | 10.0...100.0%  |
|                                  | Cool output hysteresis  | 0.1...10.0%  |
|                                  |   |  |

## Digital input commands

| Function associated to the IL logical input |                                 | Performed operation |                    | Notes   |
|---|---------------------------------|---------------------|--------------------|---|
|   |                                 | Open                | Closed             |   |
| None  |                                 | —                   | —                  | Not used  |
| PV measure hold                             |                                 | Normal operation    | PV is hold         | The value of PV is "frozen" at the time the digital input goes to the close state                   |
| Set manual mode                             |                                 | Automatic           | Manual             |   |
| Standard Setpoint                           | 1 <sup>st</sup> stored Setpoint | Local               | 1 <sup>st</sup> SP | The permanent closure <b>forces</b> the chosen stored value. Setpoint modification is not possible. |
|   | 2 <sup>nd</sup> stored Setpoint | Locale              | 2 <sup>nd</sup> SP | The impulsive closure, <b>selects</b> the stored value. Setpoint modification is allowed.           |
| Timer                                       |                                 | —                   | Timer start (RUN)  | The impulsive closure is enough to start the Timer  |

A function is assigned, through the configuration procedure to digital input.

The configured function is activated when the digital input (free voltage contact or open collector output) is in the ON state (closed). It is deactivated by setting the input to the OFF state (open).

The activation of the function through the digital input has the highest priority than through the keypad or through the serial communications.

## Technical specifications

| Features<br>(at 25°C Env. Temp.) | Description  |  |  |                      |                           |  |
|----------------------------------|--|--|--|----------------------|---------------------------|--|
| OP1-OP2 outputs                  | SPST Relay N.O., 2A/250Vac for resistive load (4A at 120 Vac)<br>SSR, 1A/250Vac for resistive load<br>Too meet the double isolation requirements OP1 and OP2 must have the same load voltage |  |  |                      |                           |  |
| OP3 output                       | SPST Relay N.O. 2A/150Vac for resistive load   |  |  |                      |                           |  |
| OP4 output                       | Logic not isolated: 0/5Vdc, ±10% 30 mA max.  |  |  |                      |                           |  |
| AL1 - AL2 - AL3 Alarms           | Hysteresis   | 0.1...10.0%  |  |                      |                           |  |
|                                  | Action   | Active high  | Action type  | Deviation threshold: | ± range                   |  |
|                                  |  | Active low   |  | Band threshold:      | 0...range                 |  |
|                                  |  | Special functions  | Absolute threshold: whole range  |                      |                           |  |
|                                  |  |  | Sensor break, Heater break and Loop break detection<br>Acknowledge (latching), activation inhibit (blocking)<br>Connected to Timer or program (if options installed) |                      |                           |  |
| Setpoint                         | Local  |  | Up and down ramps 0.1...999.9 digit/min. (OFF=0)   |                      |                           |  |
|                                  | Local plus 2 stored with tracking or Stand-by  |  | Low limit: from low range to high limit<br>High limit: from low limit to high range  |                      |                           |  |
| Special functions (option)       | Timer  | Automatic start at the power on, Digital inputs or serial Comm.s Setting time: 1...9999 s/min<br>Stand-by Setpoint: $5 \leq L D \leq 5 P \geq 5 L H I$ |  |                      |                           |  |
|                                  |  | Start-up   | Start-up Setpoint: $5 \leq L D \leq 5 P \geq 5 L H I$<br>Hold time: 0...500 min<br>Control output high limit: 5.0...100.0%   |                      |                           |  |
|                                  |  |  |  |                      |                           |  |
|                                  | Fuzzy-Tuning one shot  |  | The controller selects automatically the best method according to the process conditions   |                      |                           | One shot Auto tuning<br>One shot Natural frequency |
| Auto/Man station                 | Standard with bumpless function, digital input or serial communications  |  |  |                      |                           |  |
| Serial comm.s                    | RS485 isolated, Modbus/Jbus protocol, 1200, 2400, 4800, 9600 bit/s, 3 wires  |  |  |                      |                           |  |
| Auxiliary Supply                 | +24Vdc ±20% 30mA max. - for external transmitter supply  |  |  |                      |                           |  |
| Operational Safety               | Measure input  |  | Detection of out of range short circuit or sensor break with automatic activation of the safety strategies   |                      |                           |  |
|                                  | Control output   |  | Safety value: -100...100%  |                      |                           |  |
|                                  | Parameters output lock   |  | Parameter and configuration data are stored in a non volatile memory for an unlimited time   |                      |                           |  |
|                                  |  |  |  |                      |                           |  |
| General characteristics          | power supply (PTC protected)   |  | 24Vac (-25...+12%) 50/60Hz and 24Vdc (-15...+25%)  |                      | Power consumption 3W max. |  |
|                                  | Safety   |  | EN61010-1 (IEC1010-1) installation class 2 (2.5kV), pollution class 2<br><b>instrument class II</b>  |                      |                           |  |
|                                  | Electromagnetic compatibility  |  | Compliance to the CE standards   |                      |                           |  |
|                                  | UL and cUL approval  |  | File 176452  |                      |                           |  |
|                                  | Protection   |  | Terminal strip IP20  |                      |                           |  |
|                                  | Dimensions   |  | Pitch: 22.5 mm - depth: 114.5 mm - width: 53   |                      |                           |  |
|                                  | Weight   |  | 159 g approx.  |                      |                           |  |

## Current transformer input (optional)

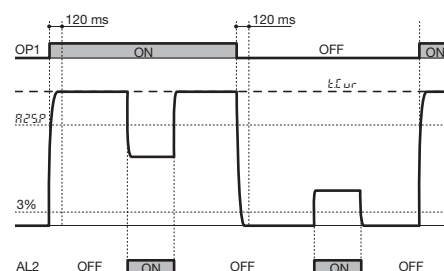
With CT option, it is possible to set an alarm threshold. The setting can be done by means the 8 or 9 configuration index of the codes O, P or Q (see page 1). It is possible to set one of the alarms (see page 1) to have an alarm when, during the ON time of the time proportional output, the load current is less than the specified threshold (index 8), or during the OFF time there is a value  $> 3\%$  of full scale load current. The alarm condition must be longer than 120 ms to set the alarm. By the parameter

### HL.F.S. CT primary high range

the load current display can be adapted to the transformer characteristics. (OFF means disabled)

During the OFF time the parameter **t.Cur** latches the last on time current value.

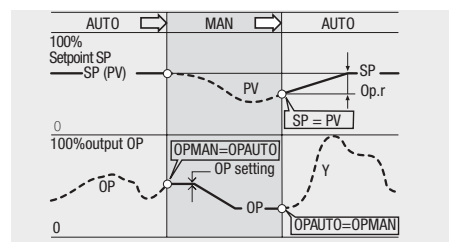
**Example:** CT input on OP1, alarm on AL2 during on time (configuration digit **P** = 8, see page 21)



## Commands

### Auto/Manual

The bumpless action is present switching between AUTO, MAN and vice versa with the parameter **A.Man**.



**!** In case of power failure, the AUTO/MAN status and the output value remain stored in the controller memory

### Timer starting

Depending on the Timer action **t.Act** selection, there can be two different starting ways:

- Automatic at the power on
- Manual by digital inputs or serial communications.

**The Timer function can be started or stopped any time.**

### Output lock

The outputs are switched to the OFF via serial communications.

**!** The outputs lock/unlock is maintained in case of power failure.

## Warranty

We warrant that the products will be free from defects in material and workmanship for 3 years from the date of delivery. The warranty above shall not apply for any failure caused by the use of the product not in line with the instructions reported on this manual.

## Serial communications connection example

